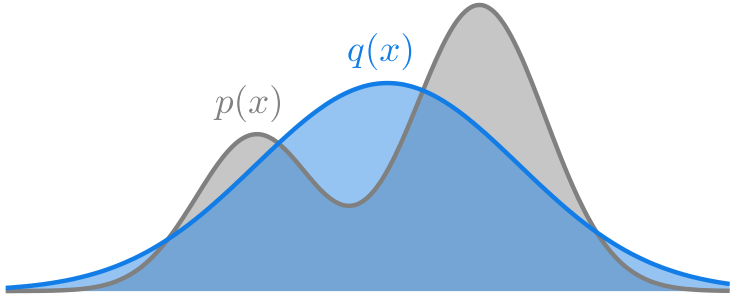
LaTeX Typesetting, Slide Simplified

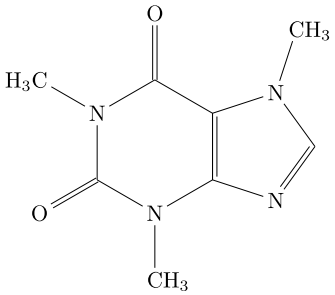
KL divergence

For distributions P and Q

$$\begin{aligned}\mathrm{KL}(P\|Q) &= \int_{x\in\mathcal{X}} p(x)\ln\frac{p(x)}{q(x)}dx \\ &= \mathbb{E}_{x\sim p(x)}\left[\ln p(x) - \ln q(x)\right]\end{aligned}$$



What is Caffeine



Properties of Caffeine

Property	Value
Formula	$C_8H_{10}N_4O_2$
Molar mass	$194.194\ \mathrm{g\cdot mol^{-1}}$
Density	$1.23\ \mathrm{g/cm^3}$
Melting point	235–238 °C

@ Video by Visual Laurence from Pixabay

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Levenberg-Marquardt method

Objective

Minimize sum of squared residuals:

$$S(\mathbf{x}) = \sum_i [f_i(\mathbf{x})]^2 = \|\mathbf{f}(\mathbf{x})\|_2^2$$

Core Update Step

Solves for $\mathbf{h}_{lm}$ (the step):

$$(\mathbf{J}^\top \mathbf{J} + \lambda \mathbf{I})\mathbf{h}_{lm} = -\mathbf{J}^\top \mathbf{f}$$

$\mathbf{J}$: Jacobian matrix of $\mathbf{f}(\mathbf{x})$

λ: Damping parameter (non-negative)

Adaptive Damping

Small λ: Approaches Gauss-Newton method (faster)

Large λ: Approaches Gradient Descent method (more robust)

λ is adjusted based on iteration success

note: add \newcommand{\mbf}{\mathbf} to preamble

Algorithm: Levenberg-Marquardt method

```
k := 0; ν := 2; x := x_0
A := J(x)^T J(x); g := J(x)^T f(x)
found := (‖g‖_∞ ≤ ε_1); μ := τ × max{a_ii}
while (not found) and (k < k_max) do
    k := k + 1; Solve (A + μI)h_lm = −g
    if ‖h_lm‖ ≤ ε_2(‖x‖ + ε_2) then
        found := true
    else
        x_new := x + h_lm
        ρ := (F(x) − F(x_new))/(L(0) − L(h_lm))
        if ρ > 0 then                    ▷ step acceptable
            x := x_new
            A := J(x)^T J(x); g := J(x)^T f(x)
            found := (‖g‖_∞ ≤ ε_1)
            μ := μ × max{1/3, 1 − (2ρ − 1)^3}; ν := 2
        else
            μ := μ × ν; ν := 2 × ν
        end if
    end if
end while
```

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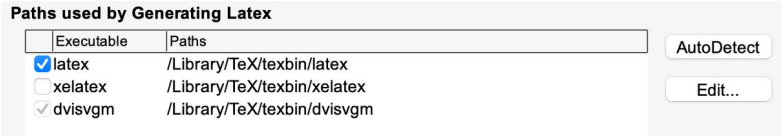
Getting Started

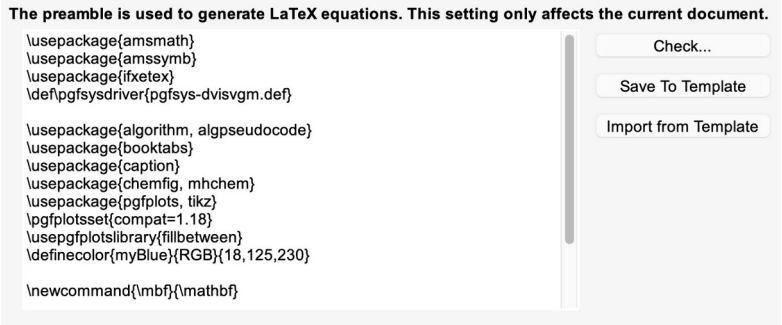
1. Install LaTeX

Tex Live, MiKTex, MacTex, etc

2. Set path and preamble in TexSlide

Files → Options → Formula





3. Insert formulas

- TextBox: use $...$ or \(...\) to typeset math in inline mode
- Toggle between equation and text mode
- Insert Latex: create equation, table, TikZ and so on

The Taylor series of a real function $f(x)$, that is infinitely differentiable at a real a, is the power series

$\displaystyle{f(a)+{\frac {f'(a)}{1!}}(x-a)+{\frac {f''(a)}{2!}}(x-a)^{2}+\cdots =\sum _{n=0}^{\infty }{\frac {f^{(n)}(a)}{n!}}(x-a)^{n}}$

↓ LaTeX + dvisvgm + TexSlide

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